

REMARKS

In the present application, claims 4-6, 8, 9-10 and 12-22 are pending. Claims 1, 2, 3, 7 and 11 have been canceled. Claims 4, 5, 6, 8, 9 and 10 have been amended. Claim 22 has been added.

No new matter has been added by way of these amendments, as each amendment is supported by the present specification. For example, claim 4 has been amended into independent form by incorporating the subject matter of base claim 1 and the intervening claim 3. Support for this amendment to claim 4 can be found in the paragraph bridging pages 1-2, and in the paragraph bridging pages 2-3 of the specification. Claims 6, 8, 9 and 10 have also been amended into independent form by incorporating the subject matter of claim 1 and/or claim 3. The amendment to claim 5 is merely editorial in nature. New claim 22 has support in Figures 13, 14, 18 and 19, wherein the part of the second layer and the insulating layer juxtaposed with each other in the direction perpendicular to the thickness direction are formed on a surface (as the common flat face) of the first layer 31 of the Nickel-base metal to be facing the electric element. Thus, no new matter has been added.

Based upon the above considerations, entry of the present amendment is respectfully requested.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and the objection and allow the currently pending claims.

Issues Under 37 C.F.R. § 1.83(a)

The drawings are objected to under 37 C.F.R. § 1.83(a). Applicants respectfully traverse.

The electrically conductive layer is already shown in the drawings, and the drawings sufficiently comply with the provisions of 37 C.F.R. § 1.83(a). Further, there are no issues of new matter since claim 2 is an originally-filed claim (whether new drawings were submitted or not). However, Applicants submit that claim 2 has been canceled, rendering this objection moot. Withdrawal of this objection is respectfully requested.

Issues Under 35 U.S.C. § 112, Second Paragraph

Claim 2 stands rejected under 35 U.S.C. § 112, second paragraph, for reasons of indefiniteness. This rejection is rendered moot upon the cancellation of claim 2. Applicants respectfully request the Examiner to withdraw this rejection.

Issues Under 35 U.S.C. § 102(e)

Claims 1 and 11 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Eichelberger et al. (U.S. Patent No. 6,396,148 B1; hereinafter Eichelberger '148). Applicants respectfully traverse.

Claims 1 and 11 have been canceled. Thus, this rejection is rendered moot, and Applicants respectfully request the Examiner to withdraw this rejection.

Issues Under 35 U.S.C. § 103(a)

Claims 2-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eichelberger '148 in view of Wachtler et al. (U.S. Patent No. 6,274,391 B1; hereinafter Wachtler '391). Applicants respectfully traverse and request the Examiner to reconsider and withdraw this rejection based on the following remarks.

The Present Invention and Its Advantages

Conventional semiconductor modules have an electrically conductive layer, an electrically insulating layer, and an electric element that is electrically connected to the electrically insulating layer. The elements are also mounted on a rigid substrate that is relatively thick.

In contrast, the present invention provides a semiconductor module that is thinner, while at the same time, shields the semiconductor module from a magnetic and/or electric noise. Specifically, the present invention is directed to a semiconductor module having at least one electric element including a semiconductor chip, an electrically conductive layer connected electrically to the electric element, an electrically conductive joint arranged between the electric element and

the electrically conductive layer to connect electrically the electric element and the electrically conductive layer to each other, a molding resin covering at least partially the electric element and the electrically conductive joint, and an electrically insulating layer contacting at least partially the electrically conductive layer. In the present invention, the electrically conductive layer includes a first layer of Nickel-base metal and a second layer of Copper-base metal that extends at least partially between the first layer and the electric element. The electrically insulating layer is juxtaposed with a part of the second layer in a direction perpendicular to a thickness direction of the electrically conductive layer so that surfaces of the electrically insulating layer and the part of the second layer both prevented from facing to the electric element extend along a common flat face.

Other embodiments of the present invention include the first layer extending on the surface of the electrically insulating layer along the common flat face (i.e., see claim 5), a metallic film extending on a surface of the electrically insulating layer prevented from facing to the electric element, wherein the metallic film is magnetically permeable (claim 10), and a boundary is between the part of the second layer of the Copper-base metal and the first layer of the Nickel-base metal that extends along the common flat face (claim 22).

In contrast to the present invention, the cited combination of Eichelberger '148 and Wachtler '391 fails to disclose all features and advantages of the present invention.

Distinctions Over the Combination of the Eichelberger '148 and Wachtler '391 References

Applicants respectfully submit that a *prima facie* case of obviousness has not been formed with respect to the asserted combination of Eichelberger '148 and Wachtler '391 because not all requirements for a *prima facie* case of obviousness have been satisfied.

U.S. case law squarely holds that a proper obviousness inquiry requires consideration of three factors:

- the prior art reference (or references when combined) must teach or suggest all the claim limitations;
- whether or not the prior art would have taught, motivated, or suggested to those of ordinary skill in the art that they should make the claimed invention (or practice the invention in case of a claimed method or process); and
- whether the prior art establishes that in making the claimed invention (or practicing the invention in case of a claimed method or process), there would have been a reasonable expectation of success.

See *In re Vaeck*, 947 F.2d, 488, 493, 20 USPQ.2d 1438, 1442 (Fed. Cir. 1991); see also *In re Kotzab*, 55 USPQ.2d 1313, 1316-17 (Fed. Cir. 2000); *In re Fine*, 5 USPQ.2d 1596 (Fed. Cir. 1988).

With regard to the present application, all of these requirements for a *prima facie* case of obviousness have not been satisfied.

(A) *Eichelberger '148 and Wachtler '391 Fail to Disclose All Claimed Features of the Present Invention*

Eichelberger '148 discloses an electroless barrier metal connection that is disposed over and in electrical contact with at least one aluminum contact pad of an integrated circuit (see Abstract; claim 1). The Office Action also refers to Figures 6A-6C and 7A-7C (at page 3 of the Office Action with regard to the rejection under § 102(e)).

Wachtler '391 discloses HDI land grid array packaged devices, whereby the Office Action refers to various parts of this reference (including Column 10, lines 19+; see pages 4-5 of the Office Action).

However, the asserted combination of Eichelberger '148 and Wachtler '391 fails to disclose all features as instantly claimed. The features of the present invention have been discussed previously. With regard to these claimed features of the presently pending claims, the cited combination of Eichelberger '148 and Wachtler '391 fails to disclose, for example, that the surfaces of an electrically insulating layer and

an electrically conductive layer are prevented from facing the electric element, which would extend along the common flat face.

Applicants enclose herewith a copy of Figure 6C of Eichelberger '148 that contains Applicants' comments thereon. Also, in an effort to compare the present invention with Eichelberger '148, Applicants are enclosing a copy of Figure 19 of the present specification, also containing Applicants' comments thereon.

The Office Action refers to Figures 6A-6C and 7A-7C of Eichelberger '148. Applicants note that Figure 6C of Eichelberger '148 is a cross-sectional view of the process structure attained during wafer based processing using electroless barrier metallization (see Col. 3, lines 63-67; see also Col. 10, lines 28-50 for partial explanation of the elements in the Figure). In Figure 6C, the surfaces of the electrically insulating layer 232 and the electrically conductive layer 209 are facing to the electric element and extend along the common flat face. However, both of the surfaces of the electrically insulating layer 232 and the electrically conductive layer 209 prevented from facing to the electric element do not extend along the common flat face. This lack of extension along the common flat face is clearly depicted in Figure 6C (see also Applicants' comments in the submitted Figure 6C).

Similarly, Wachtler '391 fails to account for the deficiencies of Eichelberger '148, because Wachtler '391 does not disclose that the surface of the electrically insulating layer and the surface of the

electrically conductive layer that are prevented from facing to the electric element extend along the common flat face.

In contrast to Eichelberger '148 (whether combined with Wachtler '391 or considered individually), the present invention has the electrically insulating layer as juxtaposed with a part of the second layer in a direction perpendicular to a thickness direction of the electrically conductive layer so that surfaces of the electrically insulating layer and the part of the second layer both prevented from facing to the electric element extend along a common flat face (see the features of pending claim 4). As can be seen from Figure 19 of the present invention, the structure of the semiconductor module of the present invention is clearly different from that of Eichelberger '148 (the features in Figure 19 are described the present specification, including at pages 11 (for feature 3, 5, etc.), 20 (for features 10A, etc.) and 34-35).

With regard to presently pending claim 6, Eichelberger '148 fails to disclose that the surface of a first layer of Nickel-base metal, which is prevented from facing to the electric element, extends between the electric element and the surface of the electrically insulating layer prevented from facing to the electric element in the thickness direction of the electrically conductive layer as instantly claimed. Eichelberger '148 does not even describe the first layer of Nickel-base metal of the present invention. And Wachtler '391 does not account for

the lack of disclosure present in Eichelberger '148, because Wachtler '391 does not describe the same mentioned features.

With regard to presently pending claim 8, whereby the film of Nickel-base metal extends on the surface of the electrically insulating layer prevented from facing to the electric element, neither of the cited references (whether combined or not) discloses all features of this claim. For instance, Eichelberger '148 does not describe a film of Nickel-base metal, and Wachtler '391 does not disclose a film of Nickel-base metal that extends on the surface of the electrically insulating layer prevented from facing to the electric element.

With regard to presently pending claim 9, neither Eichelberger '148 nor Wachtler '391, whether in combination or considered individually, discloses all features as instantly claimed. For example, the combination of Eichelberger '148 and Wachtler '391 fails to disclose a metallic film electrically connected to a electrically conductive layer extends on the surface of the electrically conductive layer prevented from facing to the electric element.

With regard to presently pending claim 10, the asserted combination of Eichelberger '148 and Wachtler '391 fails to disclose that the magnetically permeable metallic film extends on the surface of the electrically conductive layer prevented from facing towards the electric element.

Accordingly, based on the above remarks, Applicants respectfully submit that the present invention is patentably distinct from the combination of Eichelberger '148 and Wachtler '391, and that a *prima facie* case of obviousness has not been formed with regard to the Eichelberger '148 and Wachtler '391 references. Thus, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

*(B) No Requisite Motivation and Reasonable Expectation of Success
Exists for One Having Ordinary Skill in the Art to Combine
Eichelberger '148 with Wachtler '391*

Besides the lack of disclosure present in the combination of Eichelberger '148 and Wachtler '391, Applicants submit that these references have been improperly combined. This is because one having ordinary skill in the art, upon reading the cited references, would not be motivated and/or reasonably expect to be successful in combining Eichelberger '148 with Wachtler '391.

There are three possible sources of motivation to combine references: the nature of the problem to be solved, the teaching of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998). Here, one having ordinary skill in the art would not be motivated, or reasonably expect to be successful, in combining

Eichelberger '148 with Wachtler '391 because both references, even when combined, fail to disclose all features as instantly claimed. Even considering the knowledge of one of ordinary skill in the art, there is no clear guidance in either Eichelberger '148 or Wachtler '391 to achieve the formulations as presently claimed. See *In re Dembiczak*, 50 USPQ.2d 1614, 1617 (Fed. Cir. 1999). Further, the cited references ought to be considered without the benefit of hindsight reconstruction.

Thus, one having ordinary skill in the art would not be motivated and/or reasonably expect to be successful in combining the Eichelberger '148 reference with Wachtler '391. Applicants respectfully submit that the other two requirements for a *prima facie* case of obviousness have not been satisfied as well.

Conclusion

Applicants respectfully submit that a *prima facie* case of obviousness has not been formed with regard to the Eichelberger '148 and Wachtler '391 references. The asserted combination does not disclose all features of the presently pending claims, and one of ordinary skill in the art would not have the requisite motivation and reasonable expectation of success that are necessary to combine these references. Thus, Applicants respectfully request the Examiner to reconsider, and to withdraw all rejections and objections and allow the currently pending claims.

A full and complete response has been made to all issues as cited in the Office Action. Thus, Applicants respectfully request that the Examiner pass the application to issue.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez (Reg. No. 48,501) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

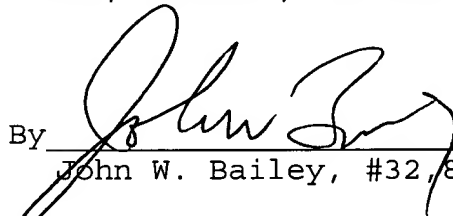
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Pursuant to 37 C.F.R. § 1.17 and 1.136(a), Applicants respectfully petition for a three (3) month extension of time for filing a response in connection with the present application. The required fee of \$920.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachments:

- Version with Markings to Show Changes Made
- Figure 19 (with markings by Applicants)
- Figure 6C of U.S. Patent No. 6,396,148 B1 (with markings by Applicants)
- Extension Fee

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 2, 3, 7 and 11 have been canceled.

The claims have been amended as follows:

4. (Amended) A semiconductor module [according to claim 3,]
comprising:

at least one electric element including a semiconductor chip;
an electrically conductive layer connected electrically to the
electric element;

an electrically conductive joint arranged between the electric
element and the electrically conductive layer to connect electrically
the electric element and the electrically conductive layer to each
other;

a molding resin covering at least partially the electric element
and the electrically conductive joint; and

an electrically insulating layer contacting at least partially the
electrically conductive layer;

wherein the electrically conductive layer includes a first layer of
Nickel-base metal, and a second layer of Copper-base metal extends at
least partially between the first layer and the electric element, and

[wherein] the electrically insulating layer is juxtaposed with a
part of the second layer in a direction perpendicular to a thickness

direction of the electrically conductive layer so that surfaces of the electrically insulating layer and the part of the second layer both prevented from facing to the electric element extend along a common flat face.

5. (Amended) [A] The semiconductor module according to claim 4, wherein the first layer extends on the surface of the electrically insulating layer along the common flat face.

6. (Amended) A semiconductor module [according to claim 3,]
comprising:

at least one electric element including a semiconductor chip;

an electrically conductive layer connected electrically to the electric element;

an electrically conductive joint arranged between the electric element and the electrically conductive layer to connect electrically the electric element and the electrically conductive layer to each other;

a molding resin covering at least partially the electric element and the electrically conductive joint; and

an electrically insulating layer contacting at least partially the electrically conductive layer;

wherein the electrically conductive layer includes a first layer of Nickel-base metal, and a second layer of Copper-base metal extends at least partially between the first layer and the electric element, and

[wherein] a surface of the first layer prevented from facing to the electric element extends between the electric element and a surface of the electrically insulating layer prevented from facing to the electric element, in a thickness direction of the electrically conductive layer.

8. (Amended) A semiconductor module [according to claim 1,]
comprising:

at least one electric element including a semiconductor chip;

an electrically conductive layer connected electrically to the electric element;

an electrically conductive joint arranged between the electric element and the electrically conductive layer to connect electrically the electric element and the electrically conductive layer to each other;

a molding resin covering at least partially the electric element and the electrically conductive joint;

an electrically insulating layer contacting at least partially the electrically conductive layer; and

[further comprising] a film of Nickel-base metal extending on a surface of the electrically insulating layer prevented from facing to the electric element.

9. (Amended) A semiconductor module [according to claim 1,]
comprising:

at least one electric element including a semiconductor chip;
an electrically conductive layer connected electrically to the
electric element;

an electrically conductive joint arranged between the electric
element and the electrically conductive layer to connect electrically
the electric element and the electrically conductive layer to each
other;

a molding resin covering at least partially the electric element
and the electrically conductive joint;
an electrically insulating layer contacting at least partially the
electrically conductive layer; and

[further comprising] a metallic film extending on a surface of the electrically insulating layer prevented from facing to the electric element, wherein the metallic film is electrically connected to the electrically conductive layer.

10. (Amended) A semiconductor module [according to claim 1,]
comprising:

at least one electric element including a semiconductor chip;
an electrically conductive layer connected electrically to the
electric element;

an electrically conductive joint arranged between the electric
element and the electrically conductive layer to connect electrically
the electric element and the electrically conductive layer to each
other;

a molding resin covering at least partially the electric element
and the electrically conductive joint;

an electrically insulating layer contacting at least partially the
electrically conductive layer; and

[further comprising] a metallic film extending on a surface of the
electrically insulating layer prevented from facing to the electric
element, wherein the metallic film is magnetically permeable.

Claim 22 has been added.